**1** Fig. 2.1 shows the structure of a plasma (cell surface) membrane.

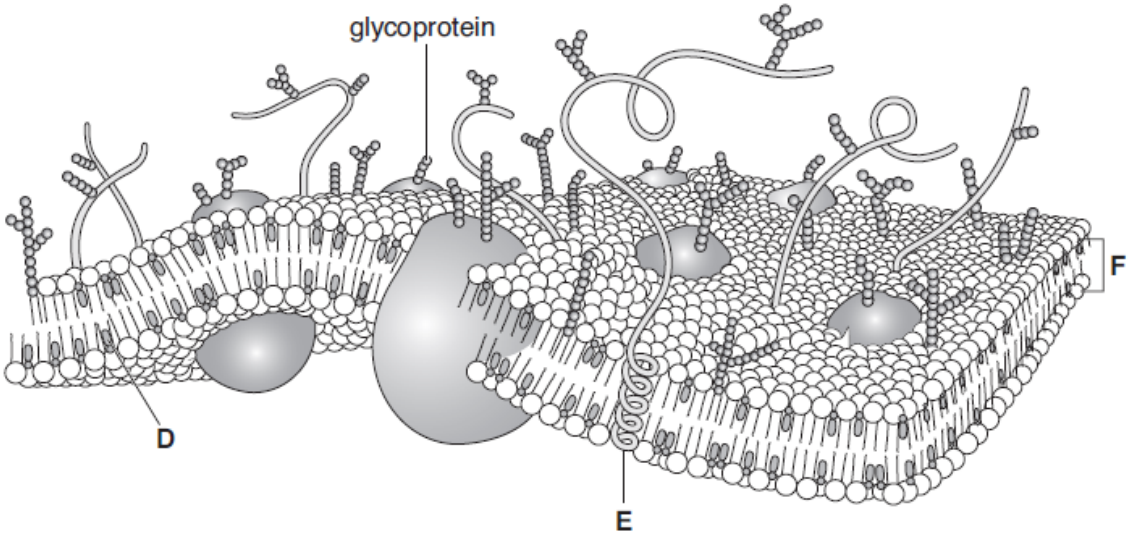


**Fig. 2.1**

**(a)** **(i)** Name the components of the plasma (cell surface) membrane labelled **D**, **E** and **F**.

**D** .....

**E** .....

**F** ..... **[3]**

**(ii)** State **one** function for each of the components **D**, **E** and **F**.

**D** .....

.....

**E** .....

.....

**F** .....

..... **[3]**

**(b)** Glycoprotein molecules are positioned in the plasma (cell surface) membrane with the carbohydrate chain outside the cell.

This is to allow the glycoproteins to act as receptors in the process of cell signalling.

**(i)** Explain what is meant by the term *cell signalling*.

.....

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..... **[2]**

**(ii)** Explain **how** a glycoprotein can act as a receptor.

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..... **[2]**

**(c)** A student investigated the effect of temperature on the release of pigment from pieces of beetroot.

She cut a fresh beetroot into four pieces and placed each piece into water at a different temperature.

After 10 minutes she removed the beetroot and used a colorimeter to test how much pigment had entered the water.

She placed the coloured water into the colorimeter and measured the percentage transmission of light through the water. Her results are shown in Table 2.1.

**Table 2.1**

| temperature of water (°C) | percentage transmission of light |
|---|---|
| 10 | 85 |
| 30 | 87 |
| 50 | 78 |
| 100 | 0 |

(i) The results show that below 50 °C little pigment had entered the water.

Explain why there was no transmission of light after the beetroot had been placed in water at 100 °C.

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.....

..... [2]

(ii) Suggest **three** ways in which the student could have improved her investigation.

1 .....

.....

2 .....

.....

3 .....

..... [3]

**[Total: 15]**

**2** **(a)** Complete the passage below.

Membranes have a variety of functions in cells. All membranes are ..... permeable. This means that they allow the passage of certain substances by processes such as active transport or ..... through the membrane. The cell surface membrane, also known as the ..... membrane, surrounds the cytoplasm. The cell surface membrane consists of a bilayer of ..... . To stabilise the structure of the membrane and keep it fluid, molecules of ..... are also found in this bilayer. **[5]**

**(b)** Membranes contain a variety of proteins. Some of these proteins are combined with carbohydrates to form glycoproteins.

Describe the functions of glycoproteins in the cell surface membrane.

*In your answer you should use appropriate technical terms, spelt correctly.*

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..... **[5]**

**[Total: 10]**

**3** Fig. 2.1 shows diagrams of four cells that have been placed in different solutions.

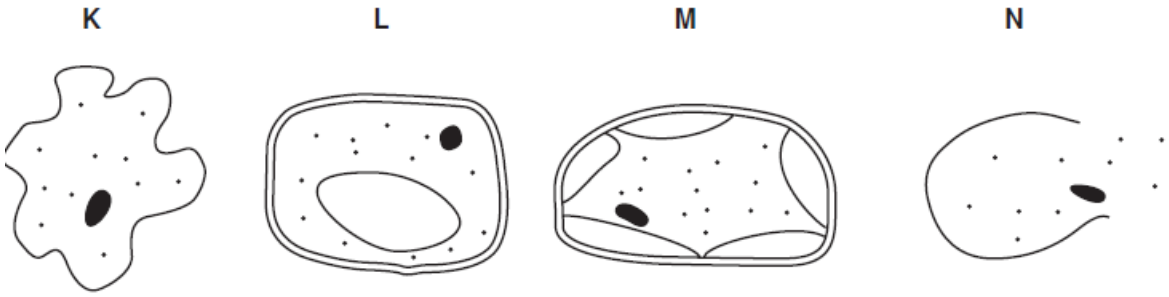


**Fig. 2.1**

**(a)** In the table below, write the letter **K**, **L**, **M** or **N** next to the description that best matches the diagram. One has been done for you.

| description | letter |
|---|---|
| an animal cell that has been placed in distilled water | |
| an animal cell that has been placed in a concentrated sugar solution | |
| a plant cell that has been placed in distilled water | |
| a plant cell that has been placed in a concentrated sugar solution | **M** |

**[3]**

**(b)** Explain, using the term **water potential**, what has happened to cell **M**.

.....

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..... **[3]**

**(c)** Small non-polar substances enter cells in different ways to large or polar substances.

Outline the ways in which substances, **other than water**, can enter a cell through the plasma (cell surface) membrane.

*In your answer, you should use appropriate technical terms, spelt correctly.*

*small, non-polar substances* .....

.....

.....

.....

.....

.....

*large substances* .....

.....

.....

.....

.....

.....

*polar substances* .....

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..... **[5]**

**[Total: 11]**

**4** A student carried out an investigation involving uptake of the stain methylene blue by yeast cells.

The investigation involved adding methylene blue to a suspension of yeast cells. Samples of the stained yeast cells were heated to different temperatures.

The student then observed the cells at high power under a light microscope.

**Table 3.1**

| temperature (°C) | cells observed stained blue (%) | colour of solution surrounding cells |
|---|---|---|
| 10 | 98 | colourless |
| 20 | 96 | colourless |
| 30 | 97 | colourless |
| 40 | 96 | colourless |
| 50 | 73 | colourless |
| 60 | 12 | light blue |
| 70 | 2 | blue |
| 80 | 0 | blue |

**(a) (i)** Yeast cells take up methylene blue by active transport.

Using **only** the information provided in Table 3.1, outline the evidence that supports this statement.

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.....

..... **[2]**

**(ii)** Suggest why some cells did **not** stain blue at 20 °C.

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..... **[1]**

**(b) (i)** Suggest **one** change that occurred to the plasma (cell surface) membranes of the yeast cells at temperatures above 60 °C.

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.....

..... **[1]**

**(ii)** Explain why the stained yeast cells lost their colour at higher temperatures.

.....

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..... **[2]**

**(c)** The student concluded that yeast cells are killed between 50 °C and 70 °C.

Suggest **one** way in which the student could have improved the **accuracy** of this experiment and **one** way in which he could have improved the **reliability**.

*accuracy* .....

.....

.....

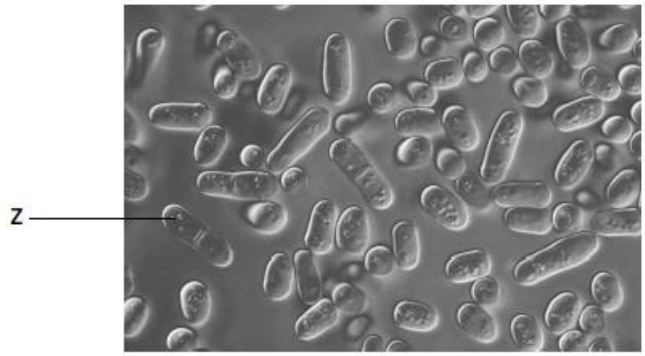
*reliability* .....

.....

..... **[2]**

**(d)** The student placed a small sample of the yeast suspension on a microscope slide and observed it under high power.

Fig. 3.1 shows what the student observed.




Cell **Z** is undergoing a process called *budding*.

Outline the process of budding in yeast.

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..... **[2]**

**[Total: 10]**

**5** **(a)** **(i)** Name the process by which water leaves a cell.

..... **[1]**

**(ii)** Describe the routes that water molecules take through the **cell surface membrane**.

.....

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..... **[2]**

A student carried out an investigation to determine the effects of different sucrose concentrations on cells from pieces of onion epidermis.

- Strips of epidermis were taken from an onion.
- Separate pieces of epidermis were placed into water and a range of sucrose solutions.
- The pieces of epidermis were left for 30 minutes before being removed.
- The pieces of epidermis were then viewed at high power under the microscope.

The student counted 100 cells from each piece of epidermis. The student noted how many cells had become plasmolysed.

The results are shown in Table 6.1.

| concentration of sucrose solution (mol $dm^{-3}$) | water potential of sucrose solution (kPa) | percentage of cells plasmolysed (%) |
|---|---|---|
| 0.0 | 0 | 0 |
| 0.1 | –260 | 0 |
| 0.3 | –860 | 3 |
| 0.4 | –1120 | 7 |
| 0.5 | –1450 | 39 |
| 0.6 | –1800 | 57 |
| 0.7 | –2180 | 83 |
| 0.8 | –2580 | 94 |
| 1.0 | –3500 | 100 |

**(b)** None of the onion epidermis cells this student observed had burst when left in pure water.

Explain why plant cells do not burst when they are left in pure water.

.....

.....

..... **[2]**

**(c)** **(i)** The water potential of the onion epidermis cells can be assumed to be the same as the water potential of a solution that causes 50% plasmolysis.

Use the information in Table 6.1 to **estimate the water potential** inside these onion epidermis cells.

..... **[1]**

**(ii)** Suggest how the student could construct and use a graph to obtain a better estimate of the water potential.

.....

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..... **[2]**

**(d)** Suggest how the student could modify the procedure to make the results more reliable and accurate.

reliable .....

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.....

accurate .....

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..... **[4]**

**[Total: 12]**